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SPECIFICATION FOR FERROUS SULPHATE HEPTAHYDRATE, AGRICULTURAL GRADE

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NEW DELHI 110002

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Indian Standard

SPECIFICATION FOR FERROUS SULPHATE HEPTAHYDRATE, AGRICULTURAL GRADE

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AMENDMENT NO. 1 MAY 2012
TO
IS 12113 : 1987 SPECIFICATION FOR FERROUS SULPHATE HEPTAHYDRATE, AGRICULTURAL GRADE

[*Page* 4, *clause* **3.2**(c)] — Substitute ‘Quantity of the material in the container;’ *for* ‘Mass of the material in the container;’.

(FAD 7)

Reprography Unit, BIS, New Delhi, India

Indian Standard

SPECIFICATION FOR FERROUS SULPHATE HEPTAHYDRATE, AGRICULTURAL GRADE

0. FOREWORD

0.1 This Indian Standard was adopted by the Bureau of Indian Standards on 14 July 1987, after the draft finalized by the Fertilizers Sectional Committee had been approved by the Petroleum, Coal and Related Products Division Council.

0.2 Iron-deficiency is a serious problem of several crop plants. It is normally observed in crops growing on alkaline soils. More specifically iron-deficiency is identified with calcareous soils. It also affects crop plants when grown on organic matter deficient soils. Cold weather is known to provoke iron-deficiency. Therefore, need for iron in agriculture is frequently felt and its application is needed to overcome the deficiency.

0.3 Although IS : 262-1982[*] covers two grades of ferrous sulphate, namely, technical and analytical, for use in variety of industries, the present standard has been drawn up specifically to cater to the needs of fertilizer industry.

0.4 It is felt that this Indian standard for ferrous sulphate, heptahydrate, agricultural grade will make its use economical for meeting iron deficiency in crops. No limit has been fixed for copper, zinc and manganese since they are useful micronutrients. A limit has been fixed for lead as it is toxic and harmful for plant health.

0.5 For the purpose of deciding whether a particular requirement of this standard is complied with, the final value, observed or calculated, expressing the result of a test or analysis, shall be rounded off in accordance with IS : 2-1960[*]. The number of significant places retained in the rounded off value should be the same as that of the specified value in this standard.

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[*] Specification for ferrous sulphate, heptahydrate (*second revision*).

[†] Rules for rounding off numerical values (*revised*).

1. SCOPE

1.1 This standard prescribes the requirements, and methods of sampling and test for ferrous sulphate, heptahydrate, for use in fertilizer industry.

2. REQUIREMENTS

2.1 Description — The material shall be in the form of green or bluish green crystals.

2.2 The material shall also comply with the requirements given in Table 1, when tested according to the methods prescribed in Appendix A. Reference to the relevant clauses of Appendix A is given in col 4 of Table 1.

TABLE 1 REQUIREMENTS FOR FERROUS SULPHATE, HEPTAHYDRATE

SL No.	CHARACTERISTIC	REQUIREMENT	METHOD OF TEST (REF TO CL No. IN APPENDIX A)
(1)	(2)	(3)	(4)
i)	Ferrous sulphate, heptahydrate ($FeSO_4, 7H_2O$), as Fe, percent by mass, *Min*	19	A-3
ii)	Free acid (as H_2SO_4), percent by mass, *Max*	1·0	A-4
iii)	*p*H of 5 percent (*m/v*) solution not less than	3·5	A-5
iv)	Matter insoluble in water, percent by mass, *Max*	1·0	A-6
v)	Lead (as Pb), percent by mass, *Max*	0·003	A-7
vi)	Ferric iron (as Fe), percent by mass, *Max*	0·5	A-8

3. PACKING AND MARKING

3.1 Packing — The material shall be packed in air-tight containers preferably jute or canvas bags with a polyethylene liner so as to protect the material from atmospheric exposure to prevent the upper layer to become lumpy brownish colour or as agreed to between the purchaser and the supplier.

3.2 Marking — The container shall be securely closed and legibly marked with the following information:

a) Name and grade of the material;

b) Manufacturers' name and recognized trade-mark, if any;

c) Mass of the material in the container;
d) Month and year of manufacture; and
e) Lot number to enable the batch of manufacture to be traced from records.

3.2.1 The container may also be marked with the Standard Mark.

NOTE — The use of the Standard Mark is governed by the provisions of the Bureau of Indian Standards Act, 1986 and the Rules and Regulations made thereunder. The Standard Mark on products covered by an Indian Standard conveys the assurance that they have been produced to comply with the requirements of that standard under a well defined system of inspection, testing and quality control which is devised and supervised by BIS and operated by the producer. Standard marked products are also continuously checked by BIS for conformity to that standard as a further safeguard. Details of conditions under which a licence for the use of the Standard Mark may be granted to manufacturers or porcessors may be obtained from the Bureau of Indian Standards.

4. SAMPLING

4.1 The procedure for taking representative samples from a lot, the number of tests and the criteria for conformity of the material to the requirements of the specification shall be as prescribed in IS : 6092 (Part 1)-1985*.

APPENDIX A

(*Clause* 2.2)

METHODS OF TEST FOR FERROUS SULPHATE, HEPTAHYDRATE

A-1. QUALITY OF REAGENTS

A-1.1 Unless specified otherwise, pure chemicals and distilled water (*see* IS : 1070-1977†) shall be used in tests.

NOTE — 'Pure chemicals' shall mean chemicals that do not contain impurities which affect the results of analysis.

A-2. PREPARATION OF SAMPLE

A-2.1 Procedure — Powder 200 g of the material to pass through 1·00 mm IS sieve [*see* IS : 460 (Part 1)-1978‡]. Keep the prepared sample in a clean glass-stoppered bottle for test purposes.

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*Methods of sampling and test for fertilizers: Part 1 Sampling (*first revision*).

†Specification for water for general laboratory use (*second revision*).

‡Specification for test sieves: Part 1 Wire cloth test sieve (*second revision*).

A-3. DETERMINATION OF IRON (as Fe)

A-3.1 Potassium Permanganate Method

A-3.1.1 *Reagents*

A-3.1.1.1 *Dilute sulphuric acid* — 4 N approximately.

A-3.1.1.2 *Standard potassium permanganate solution* — 0·1 N (*see* **51** of IS : 2316-1968*).

A-3.1.1.3 *Ortho-phosphoric acid.*

A-3.1.2 *Procedure* — Weigh accurately about 5 g of the prepared sample (*see* **A-2.1**) and dissolve it in water. Add 1 to 2 ml of dilute sulphuric acid and make up the solution to 250 ml in a volumetric flask. Pipette out exactly 50 ml of the solution in a flask. Add 10 ml of dilute sulphuric acid and 2 ml of ortho-phosphoric acid and titrate with standard potassium permanganate solution.

A-3.1.3 Calculation

$$\text{Iron sulphate, heptahydrate Fe, percent by mass} = \frac{28 \times V \times N}{M}$$

where

V = volume of standard potassium permanganate solution used,

N = normality of standard potassium permanganate solution, and

M = mass in g of the material taken for the test.

A-4. TEST FOR FREE ACID AS SULPHURIC ACID (AS H_2SO_4)

A-4.1 Reagents

A-4.1.1 *Methyl Orange Indicator* — Dissolve 0·01 g of methyl orange in 100 ml of water.

A-4.1.2 *Standard Sodium Hydroxide Solution* — 0·1 N.

A-4.2 Procedure

A-4.2.1 Weigh accurately about 1 g of the prepared sample (*see* **A-2.1**) and dissolve it in 100 ml of water. Add 4 drops of methyl orange indicator. Divide it into two equal portions. Add 1·0 ml of standard sodium hydroxide solution to one of the portions keeping the other portion for comparison of the colour.

---

*Methods of preparation of standard solution for colorimetric and volumetric analysis (*first revision*).

A-4.2.2 The limit prescribed in Table 1 shall be taken as not having been exceeded, if the purplish colour of the material under test disappears on the addition of standard sodium hydroxide solution.

A-5. DETERMINATION OF *p*H

A-5.1 Procedure — Dissolve 5·0 g of the prepared sample (*see* **A-2.1**) in 100 ml of freshly boiled and cooled water and determine the *p*H by means of a *p*H meter using glass electrodes.

A-6. DETERMINATION OF MATTER INSOLUBLE IN WATER

A-6.1 Procedure — Dissolve 10 g of the material in 250 ml of water. Add few drops of dilute sulphuric acid to prevent hydrolysis. Filter through a weighed sintered glass crucible (G_4) and wash the residue thoroughly with hot water. Dry the crucible at 110 ± 5°C to constant mass.

A-6.2 Calculation

$$\text{Matter insoluble in water, percent by mass} = 10\,A$$

where

A = mass in g of the residue.

A-7. DETERMINATION OF LEAD (AS Pb)

A-7.0 Outline of the Method — Lead is determined colorimetrically in Nessler cylinders using saturated hydrogen sulphide solution.

A-7.1 Apparatus

A-7.1.1 *Nessler Cylinders* — 50 ml capacity.

A-7.2 Reagents

A-7.2.1 *Concentrated Hydrochloric Acid* — *see* IS : 265-1976*.

A-7.2.2 *Standard Lead Solution* — Dissolve 1·60 g of lead nitrate in water and make up the volume to 1 000 ml. Transfer exactly 10 ml of the solution into a volumetric flask and dilute it again with water to 1 000 ml mark. One millilitre of this solution contains 0·01 mg of lead (as Pb). The dilute solution shall be freshly prepared.

A-7.2.3 *Dilute Acetic Acid* — approximately 1 N.

A-7.2.4 *Hydrogen Sulphide Solution* — Saturated.

A-7.3 Procedure — Weigh accurately 1·0 g of the prepared sample (*see* **A-2.1**) and add 15 ml of water. Add 6 ml of concentrated

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*Specification for hydrochloric acid (*second revision*).

hydrochloric acid and evaporate to dryness on a water bath. Dissolve the residue in water and transfer this solution into a Nessler cylinders. Dilute it with water to 30 ml and add 1 ml of acetic acid and 10 ml of hydrogen sulphide solution. In a second Nessler cylinder, carry out a control test using 3 ml of standard lead solution and the same quantities of other reagents in the same total volume of the mixture.

A-7.3.1 Dilute the contents of each cylinder to 50 ml and shake well. Compare the colour produced. The limit prescribed in Table 1 shall be taken as not having been exceeded, if the intensity of colour produced with the material is not greater than that produced in the control test.

A-8. DETERMINATION OF IRON (AS Fe)

A-8.0 General — Ferric iron is found by comparing the colour produced with ammonium thiocyanate solution against the colour of standard iron solution.

A-8.1 Reagents

A-8.1.1 *Concentrated Hydrochloric Acid* — *See* IS : 265-1976*.

A-8.1.2 *Dilute Sulphuric Acid* — 1 : 1 (*v/v*).

A-8.1.3 *Ammonium Thiocyanate Solution* — 10 percent (*m/v*).

A-8.1.4 *Standard Iron Solution* — Dissolve 0·702 g of ammonium ferrous sulphate [$FeSO_4.(NH_4)_2SO_4.6H_2O$] in water containing 10 ml of dilute sulphuric acid and dilute with water to 1 000 ml. Dilute 10 ml of this solution to 100 ml. One millilitre of the dilute solution contain 0·01 mg of iron (as Fe).

A-8.2 Apparatus

A-8.2.1 *Nessler Cylinders* — 50 ml capacity.

A-8.3 Procedure — Dissolve 1·0 g of the prepared sample (*see* **A-2.1**) in water containing 2·5 to 3 ml of sulphuric acid. The solution is made up to 250 ml and 5 ml of the solution is taken in the Nessler cylinder. Add 2 ml of hydrochloric acid and 5 ml of thiocyanate solution and the volume is made up to 50 ml with water.

Carry out a control test using 10 ml of standard iron solution in the other cylinder.

A-8.3.1 The limit prescribed in Table 1 shall be taken as not having been exceeded, if the intensity of the colour produced with the material is not greater than that produced in the control test.

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*Specification for hydrochloric acid (*second revision*).